What is claimed is:

1. A system for modeling seafloor conductivity, the system comprising a plurality of units deployed at different locations on the seafloor, each unit comprising:

an assembly adapted for measurement of horizontal electric fields on the seafloor, the assembly including a frame;

a vertical extension attached to and extending upward from the frame; and

a plurality of vertically-displaced electrodes disposed on the vertical extension at fixed heights above the seafloor to form a dipole, wherein each electrode is in electrical communication with an amplifier in the assembly.

2. The system of claim 1, wherein a lower electrode of the pair of second electrodes is positioned at a height above the frame.

3. The system of claim 1, wherein the vertical extension comprises a substantially rigid arm attached to the frame.

4. The system of claim 3, wherein the substantially rigid arm has a length in the range of 1 to 2 meters.

5. The system of claim 3, further comprising:

a cable attached to and extending from the frame;

a float disposed at a distal end of the cable; and

a second vertical dipole comprising a pair of vertically-displaced electrodes disposed on the cable for generating a third electric field signal, wherein the second vertical dipole is substantially longer than the first vertical dipole, and wherein the second vertical dipole is in electrical communication with the at least one first amplifier.

6. The system of claim 1, wherein the vertical extension comprises a cable and further comprising a float disposed at a distal end of the cable.

7. The system of claim 1 further comprising:

at least two magnetic field induction sensors disposed horizontally on the frame orthogonal relative to each other;

a second amplifier disposed within the at least one housing in electrical communication with the induction sensors for amplifying a magnetic field signal generated by each induction sensor; and

wherein the second amplifier is connected to the power supply and provides an amplified magnetic field signal to the data logging processor.

8. A system for modeling electrical conductivity of the seafloor, the system comprising a plurality of units deployed on the seafloor, each unit comprising:

a frame adapted for deployment to the seafloor;

a pair of horizontal dipoles extending from the frame in an orthogonal orientation relative to each other for generating a pair of first electric field signals;

a vertical extension extending from the frame;

a pair of electrodes vertically displaced along the vertical extension to form a vertical dipole for generating a second electric field signal;

at least one first amplifier in electrical communication with the horizontal and vertical dipoles for amplifying each of the first and second electric field signals, the first amplifier having a low input impedance and high gain;

a data logging processor in electrical communication with each of the first amplifier for receiving amplified electric field signals and storing data representative thereof;

a clocking device for synchronizing operation of the data logging processor with other data logging processors on other units within the system;

a power supply in electrical communication with the data logging processor, the clocking device and the first and second amplifiers;

at least one housing for enclosing the data logging processor, the clocking device, the first amplifier and the power supply, the at least one housing adapted for corrosion and pressure resistance in seawater;

means for deploying the unit to the seafloor; and

means for retrieving the unit from the seafloor.

9. The system of claim 8, wherein a lower electrode of the pair of second electrodes is positioned at a height above the frame.

10. The system of claim 8, wherein the vertical extension comprises a substantially rigid arm attached to the frame.

11. The system of claim 10, wherein the substantially rigid arm has a length in the range of 1 to 2 meters.

12. The system of claim 10, further comprising:

a cable attached to and extending from the frame;

a float disposed at a distal end of the cable; and

a second vertical dipole comprising a pair of vertically-displaced electrodes disposed on the cable for generating a third electric field signal, wherein the second vertical dipole is substantially longer than the first vertical dipole, and wherein the second vertical dipole is in electrical communication with the at least one first amplifier.

13. The system of claim 8, wherein the vertical extension comprises a cable and further comprising a float disposed at a distal end of the cable.

14. The system of claim 8 further comprising:

at least two magnetic field induction sensors disposed horizontally on the frame orthogonal relative to each other;

a second amplifier disposed within the at least one housing in electrical communication with the induction sensors for amplifying a magnetic field signal generated by each induction sensor; and

wherein the second amplifier is connected to the power supply and provides an amplified magnetic field signal to the data logging processor.

15. A method for modeling seafloor conductivity, comprising:

deploying a plurality of units at different locations in an area of interest on the seafloor, wherein each unit comprises:

an assembly adapted for measurement of horizontal electric fields on the seafloor, the assembly including a frame;

a vertical arm attached to and extending from the frame;

a plurality of vertically-displaced electrodes disposed on the vertical arm to form a first vertical dipole, wherein each electrode is in electrical communication with an amplifier in the assembly; and

wherein the vertical arm is substantially rigid so that the electrodes are disposed at fixed positions above the seafloor;

sensing horizontal and vertical electric fields over a pre-selected spectrum;

collecting data corresponding to the sensed electric fields from each of the plurality of units; and

generating a model of resistivity using the collected data.

16. The method of claim 15, further comprising:

extending a second vertical dipole on a cable above the frame, wherein the second vertical dipole is much longer than the first vertical dipole;

wherein the step of sensing includes sensing a second vertical electric field using the second vertical dipole.

17. The method of either claim 15 or 16, further comprising:

towing an EM transmitter close to the seafloor within the area of interest;

wherein the step of sensing comprises detecting electric fields generated by the EM transmitter.

18. The method of claim 15, wherein the assembly is further adapted for measurement of magnetic fields: